

REMARKS

Claims 1 and 4-15 are currently pending in this application. Claims 2 and 3 have been cancelled, without prejudice.

Claim 1 has been amended, without prejudice, to incorporate the subject matter of claims 2 and 3. Applicants have added amended claims 4, 5 and 7 and added new claims 9-15 to remove multiple dependencies in the claims.

No new matter has been added to the application by the foregoing amendments.

Objection to claims 4, 5 and 7 under 37 CFR 1.75(c)

At page 2 of the Office Action, claims 4, 5 and 7 are objected to under 37 CFR 1.75(c), because of the form of multiple dependency. Claims 4, 5 and 7 have been amended to remove the multiple dependency, and new claims 9-15 have been added accordingly. This amendment renders the rejection of claims 4, 5 and 7 moot.

Accordingly, the objection to claims 4, 5 and 7 should be reconsidered and withdrawn.

35 U.S.C. §112, first paragraph rejections of claims 1-5 and 7-8:

The specification and claims 1-5 have been rejected, alleging that the specification does not disclose the following subject matter of claims 1-5:

The fluorescent molecular wire comprising a polymer main chain having a linked conjugated system, wherein the optically active substituent that is linked to the polymer main chain is that of formula (I) or (II), or that the conjugated system is anything but an ethynylene.

The Office Action contends that there is nothing in the specification that would lead one of ordinary skill in the art to use any other optically active substituent or conjugated linking system other than ethynylene.

Also, claims 1-5 and 7-8 have been rejected under 35 U.S.C. §112, first paragraph, because the specification, while being enabling for the fluorescent molecular wire of claim 6 represented by formula (III), allegedly does not reasonably provide enablement for the concentration of any other fluorescent molecular wire. The Office Action contends that the

specification does not enable any person skilled in the art to which it pertains or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims, referring to claims 1-5 and 7-8, and specification, page 16 and subsequent examples. The Office Action alleges that Naemura et al. (Chem. Commun. 1996) in view of Kim et al. (Angew. Chem. Int. Ed. 2000) disclose a fluorescent molecular wire similar in structure to formula (III) of claim 6, acknowledging there is no indication for the success of the molecular wire in terms of a different molecular wire. The Office Action contends that it would require undue experimentation for one of ordinary skill in the art to make the fluorescent molecular wire in any other way. The Office Action further contends there is no indication of the success of the molecular wire in terms of any other coupling conjugated system for coupling the polymer main chain to the optically active substituent other than the ethynylene illustrated in formula (III) and the examples of the specification, as there are no other enabled conjugated systems.

Applicants respectfully traverse this rejection and request that the rejection be reconsidered and withdrawn.

Under *Vas-Cath, Inc. v. Mahurkar*, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991), to satisfy the written description requirement, an Applicant must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention, and that the invention, in that context, is whatever is now claimed. M.P.E.P. §2163.02. The test for sufficiency of support in a parent application is whether the disclosure of the application relied upon "reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter." *Ralston Purina Co. v. Far-Mar-Co., Inc.*, 227 USPQ 177, 179 (Fed. Cir. 1985) (quoting *In re Kaslow*, 217 USPQ 1089, 1096 (Fed. Cir. 1983)). M.P.E.P. §2163.02.

An Applicant shows possession of the claimed invention by describing the claimed invention with all of its limitations using such descriptive means as words, structures, figures, diagrams and formulas that fully set forth the claimed invention. M.P.E.P. §2163.02. Possession may be shown in a variety of ways including description of an actual reduction to practice, or by showing that the invention was "ready for patenting" such as by the disclosure of drawings or structural chemical formulas that show that the invention was complete, or by

describing distinguishing identifying characteristics sufficient to show that the Applicant was in possession of the claimed invention. M.P.E.P. §2163.02.

A description as filed is presumed to be adequate, unless or until sufficient evidence or reasoning to the contrary has been presented by the Examiner to rebut the presumption. *See, e.g., In re Marzocchi*, 169 USPQ 367, 370 (CCPA 1971). The Examiner, therefore, must have a reasonable basis to challenge the adequacy of the written description. M.P.E.P. §2163.04. The Examiner has the initial burden of presenting by a preponderance of evidence why a person skilled in the art would not recognize in an Applicant's disclosure a description of the invention defined by the claims. *In re Wertheim*, 191 USPQ 90, 97 (CCPA 1976).

There are many factors to be considered when determining whether there is sufficient evidence to support a determination that a disclosure does not satisfy the enablement requirement and whether any necessary experimentation is "undue." These factors include, but are not limited to:

- (A) The breadth of the claims;
- (B) The nature of the invention;
- (C) The state of the prior art;
- (D) The level of one of ordinary skill;
- (E) The level of predictability in the art;
- (F) The amount of direction provided by the inventor;
- (G) The existence of working examples; and
- (H) The quantity of experimentation needed to make or use the invention based on the content of the disclosure.

In re Wands, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988).

First, Applicants wish to direct the Examiner's attention to the discussion at page 12, line 26 – page 13, line 6, as follows:

The above-described optically active substituent is introduced directly into the polymer main chain of the fluorescent molecular wire as described above, or coupled thereto via a spacer. As the spacer, any group can be used as long as the optically active substituent is conjugated with the fluorescent polymer main chain

and the excitation energy can move freely, and mono- or poly-arylene, mono- or poly-alkylene, mono- or poly-vinylene, or a combination thereof is preferable, and an ethynylene group is more preferable.

Thus, there is disclosure in the specification that would lead one of ordinary skill in the art to use other optically active substituent or conjugated linking system other than ethynylene.

Applicants hereby submit the Second Declaration of Dr. Yoshito Tobe (hereinafter "Second Declaration") to explain that one of ordinary skill in the art would understand optically active substituents and conjugated linking systems as disclosed in the specification, and that such substituents exhibit optical activity and such conjugated linking systems can exhibit a change in electronic spectrum.

Dr. Tobe obtained a Bachelor of Engineering degree from Osaka University in 1974, a Master of Engineering degree from Osaka University in 1976, and a Ph.D. degree in Engineering (in synthetic chemistry) from Osaka University in 1979. Second Declaration at paragraph 1.

From 1979-1983, Dr. Tobe was a Research Associate with the Faculty of Engineering Science at Osaka University. From 1983-1992, Dr. Tobe was an Assistant Professor with the Faculty of Engineering Science at Osaka University. From 1992-1998, Dr. Tobe was an Associate Professor with the Faculty of Engineering Science at Osaka University. From 1998 to the present, Dr. Tobe has been a Professor in the Graduate School of Engineering Science at Osaka University. Second Declaration at paragraph 2.

Dr. Tobe's primary work has included creating new materials which have novel structures, and to reveal the properties based upon structural features, including projects relating to Extended pi-Electron Systems and Precise Molecular Recognition. Second Declaration at paragraph 3.

Dr. Tobe is familiar with the subject matter of U.S. Application Serial No. 10/590,920, of which he is an inventor. Dr. Tobe is familiar with the rejection of the specification and claims 1-5 and 7-8 under 35 U.S.C. §112, first paragraph for alleged lack of disclosure for a linking conjugated system other than ethynylene and lack of enablement. Also,

Dr. Tobe is familiar with the rejection of claims 1-3, 5 and 7-8 under 35 U.S.C. §103(a) as being unpatentable over Naemura et al., "Temperature Dependent Reversal of Enantiomer Selectivity in the Complexation of Optically Active Phenolic Crown Ethers with Chiral Amines", *Chem. Commun.* (1996) 2749-2750 in view of Kim et al., "Ion-Specific Aggregation in Conjugated Polymers: Highly Sensitive and Selective Fluorescent Ion Chemosensors", *Angew. Chem. Int. Ed.* (2000) 39, No. 21, 3868-3872. Second Declaration at paragraph 3.

In response to these rejections, Dr. Tobe sets forth his opinion and comments below.

In Dr. Tobe's opinion, the components of fluorescent molecular wire (that is, the optically active substituent, polymer main chain and a linked conjugated system) of the claimed invention are fully supported by the specification in view of the technological knowledge at the time of filing the present application. Second Declaration at paragraph 5.

Many portions of the compounds included in formula (I) of claim 1 are recognized to have asymmetry recognition ability. Second Declaration at paragraph 5. Generally, it is apparent to one skilled in the art that an optically active host compound forms each different diastereomer complex with guest compounds composed of a chiral pair of enantiomers. Second Declaration at paragraph 5. On the other hand, it is well known that host compounds having many ether oxygens as electron donors and hydroxyl groups as hydrogen donors at the guest capturing position can form complexes with guest compounds. Second Declaration at paragraph 5.

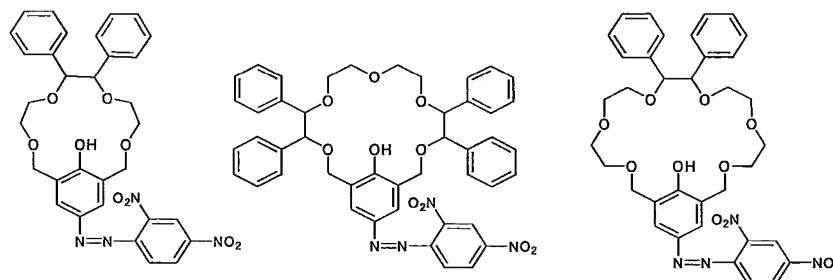
Therefore, when a compound, such as formula (I) of claim 1, has both a chiral structure and electron donors or hydrogen donors that act as a host, can exhibit so large asymmetry recognition ability. Second Declaration at paragraph 5. Even if the compound does not have a ring structure (for example, reference 9 below), the asymmetry recognition ability is so large that guest enantiomers can be differentiated by ultraviolet-visible absorption spectrometer. Second Declaration at paragraph 5. Generally if a compound has a ring structure, a rate of complexation and asymmetry recognition ability becomes large. Second Declaration at paragraph 5.

Optically active portions of compounds in the structural formula (I) of claim 1

have asymmetry recognition ability, as shown by the following References 1-9:

Reference 1: T. Kaneda et al., J. Am. Chem. Soc. 1989, Vol. 111, pp. 742-743

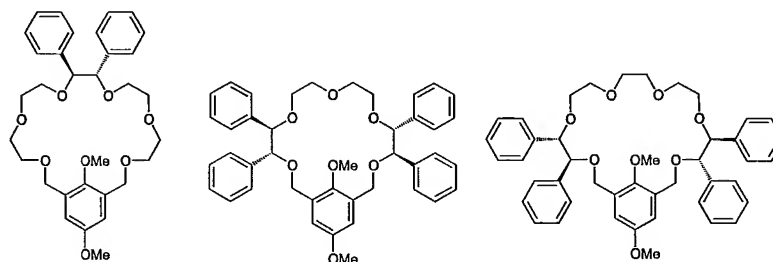
Reference 1 discloses 3 structures of chiral azophenolic acerands at page 742.



It is described that these compounds can form complexes and exhibit enantiomeric amine-selective coloration (pages 742 and 743). It is understood that crown ethers of various sizes can form complexes. Second Declaration at paragraph 5.

Reference 2: M. Sawada et al., J. Am. Chem. Soc. 1993, Vol. 115, pp. 7381-7388

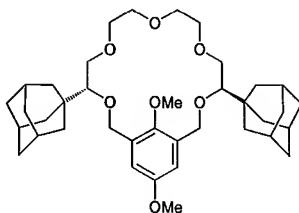
At page 7383 of the reference 2, the structures of chiral crown ethers 10 and 16 are disclosed.



Further in the abstract in page 7381, it is described that the enantioselective host-guest complexation using an ammonium ion compound as a guest was demonstrated. Therefore, a crown ether host can form complexes not only with primary amines but also ammonium salts. Second Declaration at paragraph 5.

Reference 3: K. Naemura et al., Tetrahedron: Asymmetry 1994, Vol. 5, pp. 1549-1558

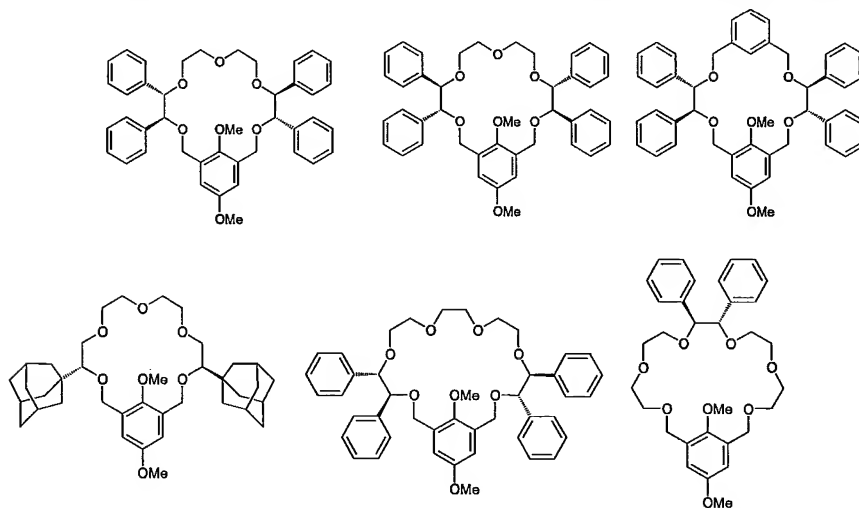
At page 1552 of the reference 3, a structure of crown ether (*S,S*) - (+) - 18 having the adamantyl group is disclosed.



It is disclosed that crown ethers formed a complex with methionine methyl ester perchlorate. It is apparent that even if a substituent in the chiral center of a crown ether is not an aryl group such as phenyl but an aliphatic group such as an adamantyl group, can form complexes. Second Declaration at paragraph 5.

Reference 4: M. Sawada et al., J. Chem. Soc., Chem. Commun. 1994, pp. 2497-2498

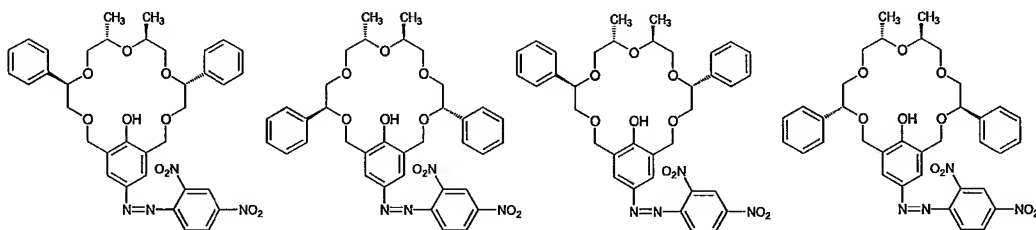
At page 2497 of Reference 4, there are described various host compounds:



It is described that enantioselectivity and complexation ability of these compounds are different from each other, however, these compounds can form complexes. See Table 1 at page 2497. Association constants (*K*) are shown in the left column, line 15 from the bottom of page 2498. Second Declaration at paragraph 5.

Reference 5: K. Naemura et al., Tetrahedron: Asymmetry 1997, Vol. 8, pp. 19-22

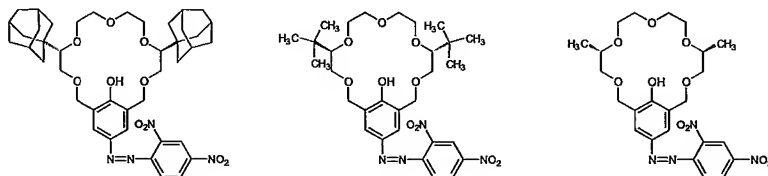
At page 20 of Reference 5, four host compounds in which substituents in the chiral center of crown ethers are placed differently from each other are disclosed:



It is described that even though there are differences in enantioselectivity due to the position of the substituent, these compounds can form complexes. Second Declaration at paragraph 5.

Reference 6: K. Hirose et al., J. Chem. Soc., Perkin Trans. 1997, Vol. 2, pp. 1649-1657

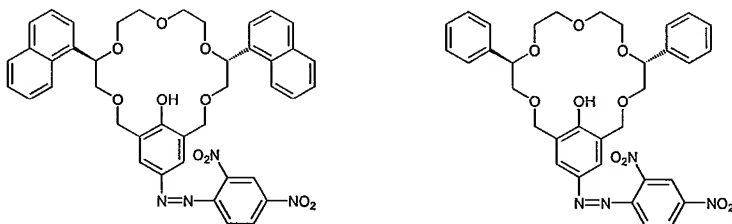
At page 1649 of reference 6, three host compounds having aliphatic groups as substituents in the chiral center of crown ethers are disclosed:



It is described that these compounds can form complexes. See abstract on page 1649 and Table 1 on page 1652. Second Declaration at paragraph 5.

Reference 7: K. Naemura et al., Tetrahedron: Asymmetry 1998, Vol. 9, pp. 563-574

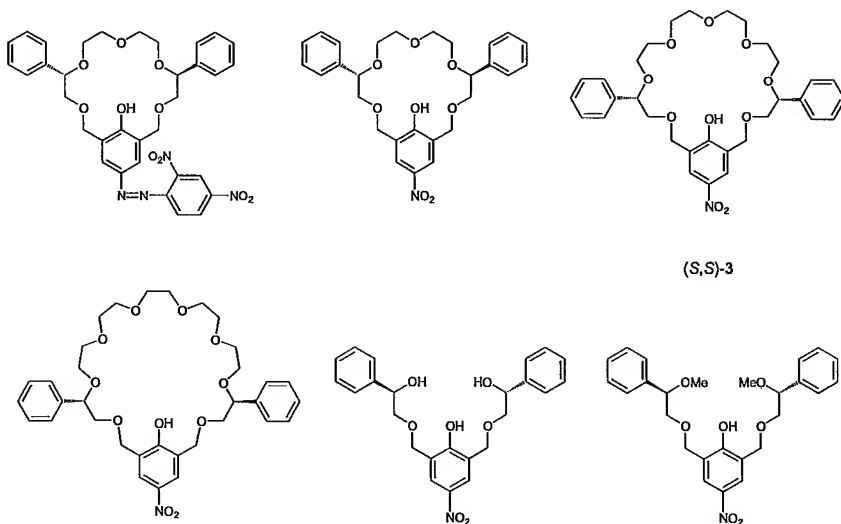
At page 564 of Reference 7, crown ethers having condensed rings as substituents are disclosed:



It is described in the abstract at page 563 that the compounds can form complexes with amines. Second Declaration at paragraph 5.

Reference 8: K. Hirose et al., Tetrahedron: Asymmetry 2003, Vol. 14, pp. 555-566

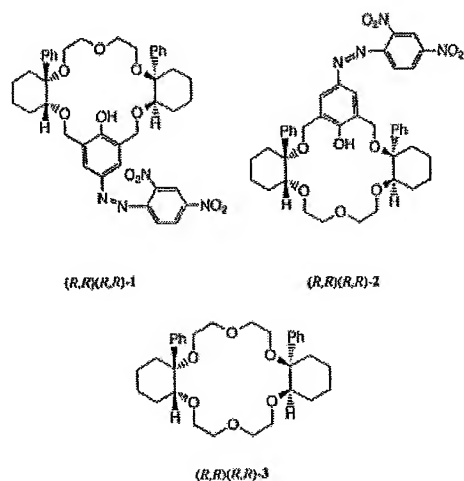
At page 555 of Reference 8, crown ethers having various sizes and podand compounds that do not have ring structures.



It is described in the abstract in page 555 that these podand compounds can have binding ability with secondary amines and a moderate level of chiral recognition ability. Second Declaration at paragraph 5.

Reference 9: K. Naemura et al., J. Chem. Soc., Perkin Trans. 1996, Vol. 1, pp. 383-388

At page 383 of Reference 9, host compounds in which a cyclohexane subunit is incorporated into crown ethers so that the chiral center of crown ethers becomes a quaternary carbon atom are disclosed:



In the abstract in page 383, it is described that these compounds have enantioselectivity. Second Declaration at paragraph 5.

As described above, many compounds are confirmed to have enantioselectivity/complexation ability. Second Declaration at paragraph 5. These optically active portions of compounds can form a portion of the compound of formula (I) of claim 1. Second Declaration at paragraph 5. Therefore, Applicants have provided evidence that the substituents of the formula (I) actually have asymmetry recognition ability (enantioselectivity/complexation ability) as shown in the above references. Second Declaration at paragraph 5.

Evidence that those skilled in the art would recognize easily that the claimed compound can be a sensor for the complexation will now be discussed. Second Declaration at paragraph 5. That is, between a substituent that forms a complex with a substrate and the portion that is conjugatively-linked to the substituent, information of the complexation can be reflected in the change of electronic and/ or optical properties such as coloration and fluorescence, which

can be precisely detected by electronic or emission spectra. Second Declaration at paragraph 5.

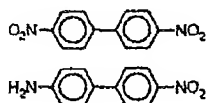
As seen from claim 1, an optically active substituent that forms complexes with optically active amines as substrates should be conjugatively-linked to the polymer main chain that can emit fluorescence. Second Declaration at paragraph 5.

First, evidence regarding the effect of conjugation between vinylene groups and ethynylene groups will be discussed. Second Declaration at paragraph 5.

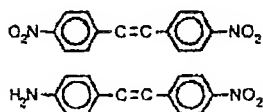
Reference 10: P. P. Shorygin et al., Russian Chemical Bulletin (Translation of Izvestiya Akademii Nauk, Seriya Khimicheskaya) 1998, Vol. 47(2), pp. 297-302

Reference 10 discloses the change of electronic spectrum compared between the case where two nitrobenzenes are linked together and the case where nitrobenzene (electron acceptor) and benzenamine (electron donor) are linked together in the following manner:

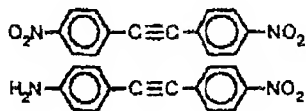
1. directly linked;



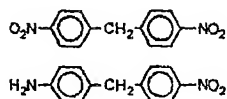
2. linked via vinyl group;



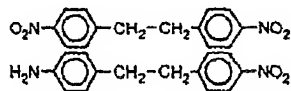
3. linked via ethynylene group;



4. linked via methylene group;



5. linked via ethylene group;

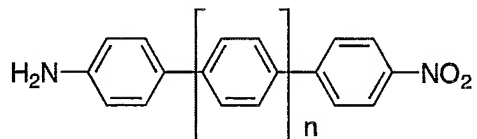


Comparing 1, 2 and 3 with 4 and 5, the shift of absorption band from nitrobenzene for 1, 2 and 3 is larger than that for 4 and 5. Second Declaration at paragraph 5. This is because the conjugation effect of 1, 2 and 3 is larger than that of 4 and 5. Second Declaration at paragraph 5. Further, in all the cases, due to the charge transfer between nitrobenzene and benzenamine, a large shift of absorption band is observed compared with the case where two nitrobenzenes are linked together. Second Declaration at paragraph 5. This is evidence that nitrobenzene and benzenamine are conjugated. Second Declaration at paragraph 5.

Reference 11: R. Koch et al., J. Phys. Org. Chem. 2008, Vol. 21, pp. 954-962

Reference 11 provides evidence for the conjugation effect of phenylene groups or arylene groups.

Reference 11 discloses optical properties in a case where plural phenylene groups are introduced between nitrobenzene and benzenamine.

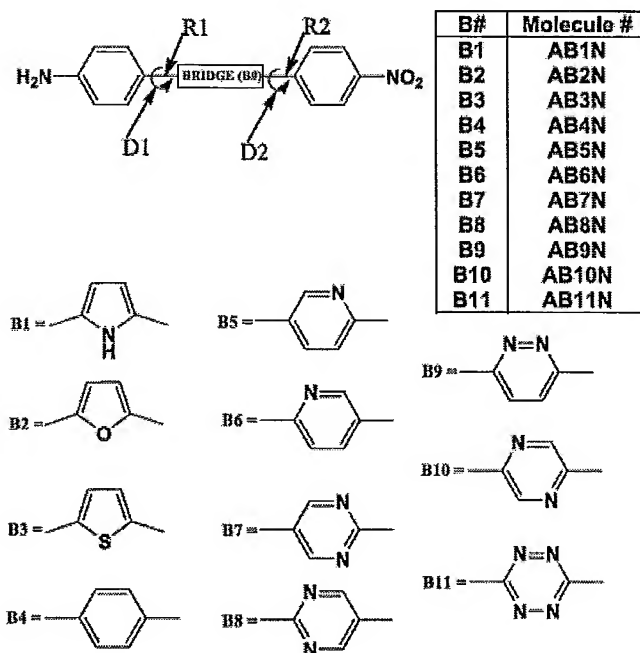


It is shown that the effect of conjugation is satisfactorily large and the optical properties changes even if plural phenylene groups are introduced between nitrobenzene and benzenamine. Second Declaration at paragraph 5.

Reference 12: S. Sitha et al., J. Mol. Str.: THEOCHEM 2006, Vol. 761, pp. 31-38

Reference 12 discloses electron transfer energy in a case where arylene groups are introduced between nitrobenzene and benzenamine. It is reported that in any case, conjugation effects appear and electronic state changes largely.

The followings are examples to show that those skilled in the art would recognize easily that the claimed compounds can be a sensor by complexation. Second Declaration at paragraph 5.

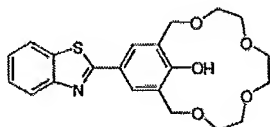


Reference 13: K. Nakashima et al, Bull. Chem. Soc. Jpn. 1987, Vol. 60, pp. 3219-3223

Reference 13 shows conjugation when crown ether substituents that can form complexes with substrates can directly bind to fluorescent benzothiazoryl groups (without spacer). Second Declaration at paragraph 5.

Reference 14: I. Tanigawa et al., Tetrahedron Lett. 1984, Vol. 25, pp. 5327-5330

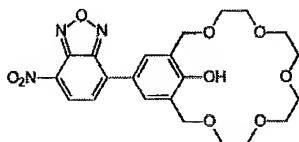
Reference 14 shows conjugation when crown ether substituents that can form complexes with substrates can directly bind to naphthothiazoryl groups. These show that the complexation can be clearly reflected as a change of fluorescence.



Second Declaration at paragraph 5.

Reference 15: H. Forrest et al., Talanta 1989, Vol. 36, pp. 335-340

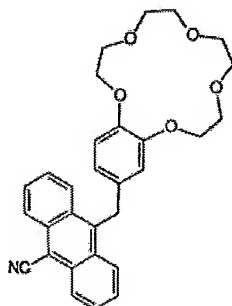
Reference 15 shows conjugation when crown ether substituents that can form complexes with substrates can directly bind to fluorescent groups. These show that the complexation can be clearly reflected as a change of fluorescence emission.



Second Declaration at paragraph 5.

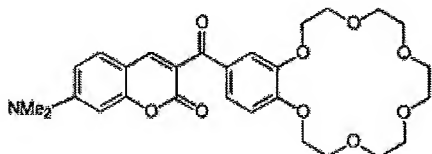
Reference 16: A. P. de Silva et al., J. Chem. Soc., Chem. Commun. 1989, pp.1183

Reference 16 shows that even the conjugation called "homoconjugation" via methylene chain can be a sensor that detects a spectral change as a signal. Second Declaration at paragraph 5.



Reference 17: R. Crossley et al., J. Chem. Soc., Perkin Trans. 1994, Vol. 2, pp.513

Reference 17 shows the fluorescence spectral change of a compound that is bound to fluorescent substituents via carbonyl group. Second Declaration at paragraph 5.



Further, if the compound is conjugated with the chromophore, it is used as a coloration sensor. Second Declaration at paragraph 5. For example, in a compound of the aforementioned Reference 1, an optically active substituent that can form a complex with a substrate is bound to 2,4-dinitrophenyl group via azo group (-N=N-) to form conjugation. Second Declaration at paragraph 5. This shows that the complexation can be reflected as a color change. Second Declaration at paragraph 5.

Further, in the examples of the present specification, optically active substituents that form complexes with substrates are linked to fluorescent polymer main chains so that they are conjugated via ethynyl group. Second Declaration at paragraph 5. It is known that the complexation can be reflected in the change of electronic spectrum by linking to phenyl groups via ethynyl group, and the compound can be a sensor in examples other than the examples of the present specification (Japanese Laid-Open Patent Publication No. 2004-75624, previously submitted in an Information Disclosure Statement). Second Declaration at paragraph 5.

As mentioned above, in my opinion those skilled in the art would recognize that between a substituent that forms a complex with a substrate and the portion that is conjugatively-linked to the substituent, information of the complexation can be reflected in the change of electronic spectrum and emission spectrum such as coloration and emission, which enables the compound to be a sensor. Second Declaration at paragraph 5.

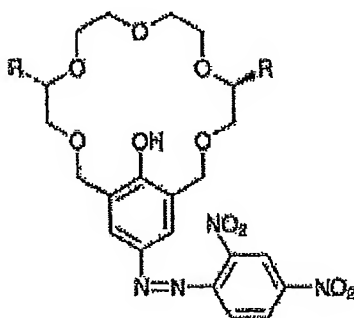
Thus, the specification in view of the knowledge of one of ordinary skill in the art would lead one of ordinary skill in the art to use other optically active substituents or conjugated linking systems as disclosed, other than ethynylene.

Also, one of ordinary skill in the art would understand optically active substituents and conjugated linking systems as disclosed in the specification in view of the knowledge of one of ordinary skill in the art, and that such substituents exhibit optical activity and such conjugated linking systems can exhibit a change in electronic spectrum.

For at least the foregoing reasons, Applicants respectfully assert that the specification and claims 1-5 and 7-8 comply with the requirements of 35 U.S.C. §112, first paragraph.

§103(a) rejection

Claims 1-3, 5 and 7-8 have been rejected under 35 U.S.C. §103(a) as being obvious over Naemura et al. (Chem. Commun. 1996) (Naemura) in view of Kim et al. (Angew. Chem. Int. Ed. 2000) (Kim). The Office Action contends that Naemura discloses an optically active phenolic crown ether of the following structure:



in which the phenolic crown ether is coupled to a ring system via a conjugated system. However, the Office Action acknowledges that the reference does not specifically disclose that the crown ether is conjugated to a polymer main chain having a linked conjugated system.

Kim allegedly discloses several polymer chains linked to crown ethers (See polymers 1-4); that conjugated polymers are versatile for the design of chemical sensors (Page 3868); and that the distance between the crown groups attached to a polymer chain is a key design parameter (Page 3871, left column), allegedly providing evidence that a longer

conjugated polymer chain comprising dual ring repeating units is more responsive than those with single ring repeating units (Page 3871, polymers 1-4). The Office Action contends that one having ordinary skill in the art would therefore choose to link the optically active substituent of Naemura to a conjugated polymer main chain of Kim in order to provide a chemosensor with enhanced sensitivity.

The Office Action argues that while the combination of the Naemura and Kim references does not specifically cite a complex with a primary amine, the design of the aforementioned molecular wire would provide the same result of the molecular wire in the instant claims. The Office Action contends that the above §103 rejection gives a straightforward motivation to combine the references of Naemura and Kim to provide the molecular wire of the instant claims. Although the sensing mechanism may, or may not, be the same in these references, the Office Action alleges that the motivation to combine need not encompass these properties. The end result of the combination allegedly is that the molecular wire would have the same structure as the rejected claims, and would be capable of the same sensing method. Further, as the mechanism or method of sensing does not further limit the structure of the claimed invention, these limitations allegedly do not carry patentable weight.

Applicants respectfully traverse the §103(a) rejection and request that the rejection be reconsidered and withdrawn.

As reiterated by the Supreme Court in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. ___, 82 U.S.P.Q.2d 1385 (2007), the framework for the objective analysis for determining obviousness under 35 U.S.C. §103 is stated in *Graham v. John Deere*. Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*, 72 Fed. Reg., No. 195 (October 10, 2007) at page 57527 (hereinafter "Examination Guidelines"). The factual inquiries enunciated by the Court are as follows:

- (1) Determining the scope and content of the prior art;
- (2) Ascertaining the differences between the claimed invention and the prior art; and
- (3) Resolving the level of ordinary skill in the pertinent art.

Examination Guidelines at page 57527.

The Office Action alleges that one of ordinary skill in the art would choose to link the optically active substituent of Naemura et al. to a conjugated polymer main chain of Kim et al. in order to provide a chemosensor with enhanced sensitivity. However, the combination of the molecular designs of Naemura et al. and Kim et al. are inconsistent because they are individual designs with different specific mechanisms. Second Declaration at paragraph 6. The design of Naemura et al. is based on thermodynamic equilibrium for non-aggregated homogeneous system. Second Declaration at paragraph 6. In contrast, the design of Kim et al. is valid for aggregation system based on energy transfer mechanism. Second Declaration at paragraph 6. Even if the designs of Naemura et al. and Kim et al. could be combined, it was unclear whether the combination was aimed to increase the performance of Naemura et al.'s homogeneous system or that of Kim et al.'s aggregation system. Second Declaration at paragraph 6. One skilled in the art would understand that aggregation and non-aggregation systems should be independent. Second Declaration at paragraph 6. Therefore, the motivation to combine the concepts of the molecular designs of Naemura and Kim cannot be rationalized. Second Declaration at paragraph 6. The combination could not be a correct molecular design before our patent application. Second Declaration at paragraph 6.

Further, the Office Action alleged that enhanced sensitivity is obtained by the combination of the molecular designs of Naemura et al. and Kim et al. However, it is required for the chiral sensor of the present invention to have not only a high sensitivity but also a high enantioselectivity. Second Declaration at paragraph 6. Combination of the molecular designs of Naemura et al. and Kim et al. is not a correct motivation for those skilled in the art who expect to satisfy these requirements. Second Declaration at paragraph 6. The increase of asymmetry recognition ability of the present invention would not be expected even if the designs of Naemura et al. and Kim et al. were combined, and therefore, in my opinion the invention of present claim 1 is significant and inventive. Second Declaration at paragraph 6.

In Naemura et al., for sensing the enantiomer selectivity, the absorption of light, which is proportional to the rate of the complexation of crown ether with a chiral amine, is measured. Second Declaration at paragraph 7. In Kim et al., for sensing the ion, the aggregation phenomenon of the host molecules is measured as the absorbance or the fluorescence quenching,

but it cannot be expected what is proportional to the aggregation. Second Declaration at paragraph 7. On the other hand, in the present invention, the quenching behavior in emission of the host polymer molecule is measured for sensing the enantiomer selectivity, and the quenching behavior is not associated with the aggregation of the host polymer molecule. Second Declaration at paragraph 7. In Dr. Tobe's opinion, one having ordinary skilled in the art can easily understand that the absorption phenomenon, the aggregation phenomenon, and the quenching phenomenon are different. Second Declaration at paragraph 7. Thus, the sensing mechanisms in Naemura et al., Kim et al., and the present invention are completely different from each other. Second Declaration at paragraph 7.

The Office Action asserted that there is motivation to combine the molecular structure capable of realizing the absorption of light which is proportional to the complexation rate (i.e., the crown ether of Naemura et al.) with the molecular structure capable of inducing the aggregation phenomenon of sensor molecules (i.e., the polymer of Kim et al.), thereby designing a chiral sensor in which the absorption of light, which is proportional to the complexation, or the aggregation phenomenon is not utilized for sensing. However, the Office Action does not explain why one having ordinary skill in the art has motivation to combine such different sensing mechanisms (i.e., the absorption of light and the aggregation phenomenon) so as to sense the chirality by using further different sensing mechanism, that is, the quenching in emission of the fluorescent molecular wire. Second Declaration at paragraph 7.

In Dr. Tobe's opinion, in order to achieve a high sensitivity that could not have been attained by conventional low molecular weight sensors, one having ordinary skilled in the art would not have reasonably been expected to combine the sensing mechanisms of Naemura et al. and Kim et al. Second Declaration at paragraph 7. In general, when the sensing method with a high sensitivity is employed, the sensing has to be performed in the condition of low concentration of the target or sensor molecule, so that the complexation rate tends to be lowered. Second Declaration at paragraph 7. Therefore, in Dr. Tobe's opinion, one having ordinary skill in the art does not design a molecular sensor with a high sensitivity based on the sensing method utilizing the absorption and emission phenomena which are proportional to the complexation rate. Second Declaration at paragraph 7. That is, there is no motivation to combine the

molecular structure of Naemura et al. with polymer of Kim et al. Second Declaration at paragraph 7.

Furthermore, as seen from claim 8, the fluorescent molecular wire of the present invention has also an improved asymmetry recognition ability compared to a monomeric compound having the same structure as the optically active substituent. Second Declaration at paragraph 7. To this day, there is no generally accepted theory for the improved effect of the asymmetry recognition ability. Second Declaration at paragraph 7. Therefore, in Dr. Tobe's opinion, the fluorescent molecular wire of the present invention would not have been obvious over Naemura et al. and Kim et al. Second Declaration at paragraph 7. This feature of the present invention can be explained with reference to Fig. 4 of the present specification (see Example 18 on pages 36 to 37). Second Declaration at paragraph 7.

In particular, the features of the present invention recited in claim 8 are (i) enhancement of detection sensitivity for a substrate to be detected, (ii) achievement of signal conversion to increase selectivity of chiral sensor at the chiral recognition site compared to the corresponding monomer and to amplify the increased asymmetry selectivity, and (iii) simultaneous achievement of (i) and (ii). Second Declaration at paragraph 7. In view of the technical level at the filing date of the present invention, in Dr. Tobe's opinion, it would not have been easy to achieve even the feature (i), and even more the feature (ii). Second Declaration at paragraph 7.

For at least the foregoing reasons, claim 1 is unobvious over the disclosures of Naemura et al. and Kim et al. Claims 4-15 depend directly or indirectly from claim 1 and are unobvious over the disclosure of Naemura et al. and Kim et al. for at least the same reasons as with respect to claim 1. Accordingly, Applicants request reconsideration and withdrawal of this rejection.

Conclusion

It is believed that any pending objections and rejections have been addressed. However, the absence of a reply to a specific rejection, issue, or comment does not signify agreement with or concession of that rejection, issue, or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or

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all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

Applicants submit that the pending claims are in condition for allowance, which action is requested. The Examiner is invited to contact the undersigned directly at 412-227-3061 with any questions.

Respectfully submitted,
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